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ABSTRACT

OMNITAB is an interpretive computing system that enables the nonprogramer to use a computer to perform calculations and manipulations on tabulated data without prior knowledge of computers and computer languages. Because OMNITAB is widely available, and can be used to perform a variety of operations, instructors selected it for use in a statistics laboratory. Psychology students enrolled in a statistics course used the computer laboratory section to perform computational exercises. The objectives of this laboratory program were to overcome the typical student's fear or dislike of handling numbers, to avoid the boredom associated with mechanical operations in statistics, to motivate the student, and to introduce the student to the computation center. (CH)

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USING OMNITAB INTERACTIVELY IN A STATISTICS LABORATORY*

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USING OMNITAB INTERACTIVELY IN A STATISTICS LABORATORY

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ABSTRACT

OMNITAB is an interpretive computing system that enables the non-programmer to use a large digital computer to perform a large variety of calculations and manipulations on tabulated data without any prior knowledge of computers and computer languages. This language has been used successfully in an undergraduate statistics laboratory, and a description of this use is given. Modifications designed to make OMNITAB more efficient for teaching purposes are also described.

USING OMNITAB INTERACTIVELY IN A STATISTICS LABORATORY

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INTRODUCTION

Most psychology departments attempt to teach statistics to both undergraduate and graduate students. In some cases, the result is student frustration. This is understandable, and three obvious reasons why are the following:

1. Typically, students majoring in psychology dislike quantitative topics--they do not like to handle numbers. But students are forced to handle numbers because homework or laboratory problems are invariably required.

2. If realistic problems are used in the traditional statistics laboratory, repetitious mechanical operations are necessary that are more suited to computers than humans. This type of numerical problem solving is time consuming, and careless errors are frequent. Most of the student's time, effort, and attention is not directed toward learning statistics; instead, it is spent in memorizing short-cut formulas for computational ease, entering and checking numbers at the keyboard of a calculator, and finding and correcting computational errors.

3. If example and laboratory problems are kept small and simple, they are not realistic, and the relevance and usefulness of the course is questioned.

At The University of Texas at Austin, we are attempting to overcome these problems by augmenting classroom instruction in statistics with an on-line computerized laboratory. The goal is to make statistics a more enjoyable and valuable course for both undergraduate and graduate students.

There are three basic objectives in our program: first, to overcome the typical student's dislike or fear of handling numbers by providing the student with a "number cruncher." By showing the student how to use a computer, we strive to make handling numbers easy and enjoyable rather than frustrating. Second, by introducing the computer as a tool, the complex laboratory problems are used without introducing the boredom usually associated with the mechanical operations of numerical problem solving. And third, motivating the student by providing a new skill (the use of a computer and a little knowledge about a computer center) will be viewed not only as immediately valuable and useful in class, but also as having potential applications outside the statistics class.

To accomplish the three objectives above, the students needed to learn a language that had the following characteristics:

1. It must be easy to learn. This is very important, because the cost of learning some computer languages in terms of time and frustration is greater than the benefits gained in the statistics class.

2. It must perform all the necessary operations for solving complex as well as simple statistical problems.

3. It must be useful for a variety of problems that students (especially graduate students) encounter outside the classroom in which the use of a digital computer would be beneficial.

4. It must be widely available rather than unique to the University of Texas Campus.

The language that was selected is called OMNITAB. OMNITAB was developed and is maintained by the National Bureau of Standards, and it has met all of the requirements stated above. The purpose of this paper is to describe how OMNITAB was used in both an undergraduate and a graduate statistics course, and to describe the basic modifications we have made and plan to make to render OMNITAB a more efficient teaching device.

OMNITAB LABORATORY (OMNILAB)

The OMNITAB Laboratory (OMNILAB) discussed in this paper was designed to supplement any one of three types of classroom instruction available to statistics students at the University of Texas. OMNILAB has been used by the first author in three classes (two graduate and one undergraduate) over the past year in which the traditional textbook and lecture system was used. Plans are being made to incorporate OMNILAB into a

self-paced introductory course taught in the Psychology Department at The University of Texas at Austin by Dr. R. K. Young. In this course, a programmed textbook is used, and multiple choice tests are given. Another type of self-paced course in statistics was developed, and is taught by Dr. Gerald Wagner of the Mechanical Engineering Department at Texas. In Dr. Wagner's class, the student selects a module covering a specific topic to be learned. The student is then quizzed by the computer and the interaction continues until the student has mastered the module. OMNILAB has been designed to be compatible with this course as well as the statistics courses offered in the Psychology Department.

OMNILAB, then, is somewhat independent of the first stage of teaching statistics in which students must commit a set of basic principles and formulas to memory. The second state of learning statistics, in which the novice statistician tests unfamiliar principles and newly acquired formulas on real problems, is where OMNILAB is designed to be used.

THE LANGUAGE

OMNITAB is an interpretive computing system that enables the non-programmer to use a large digital computer to perform a large variety of calculations and manipulations on tabulated data without any prior knowledge of computers or of computer languages. The OMNITAB master program consists of a set of 177 FORTRAN subprograms which interprete and execute

instructions written in the form of simple English sentences. To understand how OMNITAB works, it is helpful to imagine a large worksheet having 50 rows and 20 columns. (The dimensions of the worksheet in OMNITAB are variable and may be set by the user.) OMNITAB instructions are used to put data into the columns of the worksheet, to calculate using the data, to rearrange the data, and to output the data in various ways. Only the initial word (a command) and the subsequent numbers (arguments) of an OMNITAB instruction are used by the master program, so descriptive comments may be included to aid in understanding the meaning of the instruction. Instructions are executed as they are encountered.

Free formatted input and output and a very simple set of basic instructions make basic OMNITAB as easy to master as a modern hand calculator. The use of these instructions can be demonstrated by the following example: To get data into the worksheet, one merely tells the computer

SET the following numbers into column 1

and follows the statement with numbers placed anywhere on the card. Commands like ADD, SUBTRACT, MULTIPLY, DIVIDE, SUM, AVERAGE, SQUARE, ORDER, SORT, etc., can be used to perform calculations and to manipulate the data in the worksheet. A simple example is:

SUM the numbers in col 1 and put the answer in col 2

To print data stored in the worksheet, one merely says:

PRINT the data stored in col 1 and in col 2

A set of higher order commands (HISTOGRAM, STATISTICAL ANALYSIS, CORRELATION, FIT (least squares regression), ANALYSIS OF VARIANCE, etc.) provide statistical packages designed to handle commonly encountered statistical problems. A complete set of instructions and a description of the OMNITAB system are given in the National Bureau of Standards Handbook 552, OMNITAB II--A User's Reference Manual, by Hogben, Peavey, and Varner. The Handbook may be obtained from the Government Printing Office for $2.00.

EXAMPLES OF LABORATORY USE OF OMNITAB BY BEGINNERS

A beginning OMNITAB programmer is reminded that each instruction is executed as it is encountered and interpreted, so the order of instructions controls the flow of computations in the same way that hand calculations are performed and recorded in a multi-columnar pad. Students are encouraged to write out the steps of a desired calculation is simple English sentences, and then the list of sentences is taken as the OMNITAB program. For example, the steps for calculating the variance of a set of numbers are:

SUM the numbers

DIVIDE by N

SUBTRACT the mean from each number

SQUARE the resulting deviation scores

SUM the squared deviations

DIVIDE by N-1

If the concept of a worksheet is added to keep track of the numbers, then the OMNITAB program is complete. To illustrate the use of basic OMNITAB, the instructions and a solution for a laboratory problem are presented in Table 1. (See Appendix 1.) This laboratory problem was assigned to 50 undergraduate students (mostly sophomore Psychology and Nursing majors) in an introductory statistics class. These students had completed a week of class during which the topics of frequency distributions and summary statistics were covered in lecture and in the assigned chapters in the text. All except five were completely naive in regard to computer use or computer languages. A short description (about 30 minutes) of how OMNITAB works was given in class, and students were given a copy of the basic set of instructions to be used.

The laboratory work was done in a classroom provided by Project C-BE, NSF Grant GY-9340. The room is equipped with five DataPoint terminals having CRT's as display devices, and which operate at 110 or 300 BAUD. The laboratory sequence follows:

12 noon	Five DataPoints are turned on, and the instructor logs in using the class number.
	Data files are read, and OMNITAB is requested.
12:05	A READY signal indicates that OMNITAB is ready to go.
12:05-3:30	Students arrive at their convenience, and have to wait a short while to get on a terminal. To start, a student issues a system command to label output directed to a line printer. Each student takes about 15-20 minutes to work a laboratory problem assigned previously in class.

After obtaining a solution to the lab problems on the screen, the student asks OMNITAB to print out the solution at the computer center or at a nearby line printer.

The student then walks across the street and picks up the output. Additional work is done on the output, and then the output is turned in as a lab report.

4:00 Laboratory is over. All psychology students leave.

The laboratory sessions were monitored by the first author, and the following statistics were calculated:

Number of students attending lab	47
Number of students completing lab	47
Average time per student on terminal	20 minutes
Average cost per student	$.38

Students were graded on a Pass/Fail basis for lab work. A completed and correct computer output, appropriately labeled, was required to receive a passing mark for the lab.

It was surprising to find that every student used OMNITAB effectively during this first session. Most students made mistakes entering OMNITAB commands, but the error messages which immediately follow improper instructions allowed the student to make self-corrections. This immediate feedback aspect of OMNITAB makes the language almost self teaching. The first 5 students on the terminals needed aid from the lab supervisor to get started; subsequently, students watched the preceeding user, and this acquired familiarity resulted in very few appeals to the supervisor for aid.

A few complaints were voiced, mostly concerning slow response time on the time-sharing system, but almost all of the students seemed to enjoy the lab.

A later laboratory of the same introductory class (which was also an assignment in a graduate statistics course following a lecture on regression and correlation) is shown in Table 2. (See Appendix II.)

Since this lab was during the second half of the course, it was assumed that students knew how to calculate simple summary statistics like $b_{x,y}$, $r_{x.y}$, s_x, and s_y, so these statistics were calculated automatically and stored in the worksheet using higher order commands (CORRELATION, FIT, and STATISTICAL ANALYSIS) rather than by step by step calculation. The use of these higher order commands allows the emphasis in laboratories concerning advanced topics to be placed on the relationship among various statistics, rather than how to calculate them.

Again, all of the students who attended the lab produced a correct output (some on the 2nd try). The average terminal time per student was less than 30 minutes, and the average cost per student was less than $.45 .

The example labs given in Tables 1 and 2 are two of the ten labs being developed for the OMNILAB sequence. The complete set of ten labs include the following: (1) Frequency distributions and summary statistics, (2) Standard scores, (3) The normal distribution, (4) Sampling distributions and t, (5) X^2 and r, (6) correlation, (7) regression, (8) F distribution, (9) Anova I, and (10) Anova II. A laboratory manual and a

simplified instruction manual for OMNITAB are being developed as part of Project C-BE, NSF Grant GY-9340. Both manuals are being developed for undergraduate classes, and the manuals will be evaluated and tested during the Spring and Summer of 1973.

MODIFICATIONS OF OMNITAB

The basic modification of OMNITAB at UT-Austin is the interactive version developed for use on remote terminals under the time-sharing system called TAURUS. Scott Harris of The University of Texas at Austin Computation Center did the necessary modifications to implement the time-sharing version. Since using OMNITAB interactively allows the student to have immediate feedback concerning calculations and errors, it is almost a necessity for efficient use of OMNITAB as a teaching tool. The unavoidable wait between submission of a job in the batch processing mode and the eventual output tends to discourage students from using the computer; the interactive mode tends to provide a motivating force that encourages rather than discourages students in their use of the computer.

A second modification of OMNITAB is planned to make the system a more versatile teaching device. The proposed modification is called a CHECKPOINT routine. It is designed to allow an instructor to initialize the OMNITAB program with stored instructions and to initialize the worksheet with instructions and data. For example, using the CHECKPOINT routine, a set

of commands could be stored by the instructor that read the data from a tape to the worksheet. Such a set of commands could be executed by a single statement such as

EXECUTE problem 10

This would initialize the worksheet and give instructions to the student as shown in Table 3 (See Appendix III). The addition of the CHECKPOINT routine would allow OMNITAB to be used in a completely self-paced manner.

Anticipating the use of OMNITAB in a large self-paced class, a record keeping and grading routine has been designed. To use the recorder/grader, each student must write selected answers to a laboratory exercise onto a tape. The tape then is processed by a recorder/grader program developed by Dr. Jan Bruell (Department of Psychology). The complete class roster is derived from tapes processed in this way. Initially, OMNILAB was being developed as a supplement to the textbook/lecture method of instruction; the second phase of using OMNITAB as a teaching device will be directed toward using OMNITAB in a self-paced manner.

THE DESIRABLE FEATURES OF OMNITAB--A SUMMARY

The laboratory examples shown in Tables 1 and 2 indicate how OMNILAB is a useful teaching aid in a statistics lab. A summary of important points follows:

1. It is easy to learn. Sophomore psychology students can use OMNITAB to work a laboratory problem (see Table 1) in the same laboratory session in which they are introduced to the computing system.

2. The problem of entering data on a keyboard is solved by storing a set of data on a tape. A student then can just ask for the data (and print it out to see it) rather than manually entering each number.

3. Using OMNITAB, a student can work a problem using the same steps required by hand calculation, except now there is no chance of careless errors in performing the calculation (thanks to the error free number cruncher which is controlled by OMNITAB).

4. OMNITAB can give immediate feedback following calculation; if a student wants to view an answer, he merely asks to see it displayed.

5. When OMNITAB is used, more realistic and complex problems can be used that are unreasonable in a non-computerized lab; and because of the speed of OMNITAB, more problems can be assigned and worked during each laboratory session. Also, the system can be used for solving complex statistical problems, either by programming the step-by-step procedure, or by using the statistical packages provided.

6. A neat, readable copy of the student's lab work can be easily obtained, even if CRT displays are used, by asking for a print-out at the central computer center.

Finally, a very important benefit of using OMNITAB in a statistics laboratory is that psychology students are introduced to the Computation Center Facility. Students not only are aided in learning statistics; their experience also dispels many misconceptions of what a computer does, and it provides some basis for understanding how computers affect their lives.

APPENDIX I

Table 1

An example laboratory exercise. Lab 1: Using OMNITAB to calculate summary statistics.

The lines below enclosed in quotation marks were entered by the student; the other lines were initiated by the computer. The OMNITAB commands their arguments are underlined for the reader's benefit. The other words in the instructions are ignored by the computer; they could be left out, but they prove to be powerful mnemonic aid to the novice user.

"BLOWUP, MARY Q. STUDENT." This command labels subsequent remote output with S's name.
"EXECUTE LAB 1" See text and Table 3 for explanation of this instruction.

INSTRUCTIONS. THE 91 X AND Y SCORES GIVEN ON P. 100 OF "BASIC STATISTICS" BY W.L. HAYS ARE STORED ON MAGNETIC TAPE. USE THE FOLLOWING OMNITAB INSTRUCTIONS TO READ THESE DATA INTO THE OMNITAB WORKSHEET.

FORMAT B (F2.1, F3.0)
REWIND TAPE A
CREAD TAPE A B FORMAT 91 X AND Y SCORES INTO COLS 1 AND 5

AFTER YOU OBTAIN THE DATA, CALCULATE THE MEAN, VARIANCE, AND THE STANDARD DEVIATION FOR EACH SET OF SCORES. THEN USE THE "FREQUENCY" AND "HISTOGRAM" COMMANDS TO PRINT OUT FREQUENCY DISTRIBUTIONS ACCORDING TO YOUR OWN SPECIFICATIONS.

BEGIN YOUR OMNITAB PROGRAM.

"DIMENSION THE WORKSHEET 100 ROWS BY 10 COLS"
READY
"FORMAT B(F2.1,F3.0)"
READY
"CREAD TAPE A B FORMAT 91 X'S AND Y'S INTO COLUMNS 1 AND 10"
READY

```
"SUM THE X SCORES IN COL 1 AND PUT THE ANSWER IN COL 2"
    READY
"DIVIDE THE SUM IN COL 2 BY N= 91.0 AND PUT THE MEAN BACK IN COL 2"
    READY
"SUBTRACT THE MEAN IN COL 2 FROM EACH SCORE IN COL 1"
    *** COMMAND REJECTED, REENTER
    *** 2 IS AN ILLEGAL NUMBER OF ARGUMENTS
"SUBTRACT THE MEAN IN COL 2 FROM X'S IN COL 1 AND PUT ANSWER IN COL 6"
    READY
"SQUARE THE DEVIATION SCORES IN COL 3 AND PUT THE SQRED DEVS IN COL 3"
    READY
'SUM THE SQRED DEVS IN COL 3 AND PUT THE ANSWER BACK IN COL 3"
    READY
"DIVIDE COL 3 BY 90.0 AND PUT THE AVERAGE SQUARED DEV IN COL 3"
    READY
"SQRT OF THE VARIANCE IN COL 3, PUT THE ANSWER (STD DEV) INTO COL 4"
    READY
"NOTE                MEAN                VAR                STD DEV"
    READY
"ABRIDGE TWO 1 OF COLS 2, 3, AND 4"
            4.1978022          3.0158193          1.7366115
    READY
"FREQUENCY DIST OF COL 1; USE 20 CLASSES, INT SIZE OF .5, LOWR LMT= -.25, F(I) IN 2"
    READY
"SET MIDPOINTS IN COL 3"
    READY
"0 .5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5
    READY
"HISTOGRAM USING MIDPOINTS IN COL 3 AND FREQUENCIES WHICH WERE PUT IN COL 2"
```

MID-POINTS	FREQUENCY	
0.	0	
.5000000	0	
1.0000000	0	
1.5000000	0	
2.0000000	10	+ + + + + + + + + +
2.5000000	11	+ + + + + + + + + + +
3.0000000	9	+ + + + + + + + +
3.5000000	15	+ + + + + + + + + + + + + + +
4.0000000	15	+ + + + + + + + + + + + + + +
4.5000000	3	+ + +
5.0000000	4	+ + + +
5.5000000	3	+ + +
6.0000000	6	+ + + + + +
6.5000000	4	+ + + +
7.0000000	3	+ + +
7.5000000	4	+ + + +
8.0000000	4	+ + + +
8.5000000	0	
9.0000000	0	
9.5000000	0	

READY
"PRINT THERE" This directs printed output to a printer at the Computer Center rather than to the user's local terminal. This hard copy is what the Student turns in as a lab report.

READY
"NOTE X (X M)" This labels output caused by next instruction.

READY
"RESET NRMAX TO 91"
"PRINT COLS 1 AND 6" This prints out the 91 raw scores and deviation scores.

READY
NOTE MEAN VAR STD DEV" This labels output of next instruction.

READY
"ABRIDGE TOW 1 OF COLS 2, 3, AND 4" The next two instructions print out what the Student had inspected earlier on the display.

READY
"HISTOGRAM MID PTS IN 3, FREQS IN 2"

READY
"PRINT HERE" This tells the computer to direct printed output to user's terminal once again.

The same procedure would be used to obtain summary statistics and a frequency distribution for the Y scores.

APPENDIX II

Table 2

Lab 7: Using high-order commands (CORRELATION and FIT) to show the relationship between Regression and Correlation. The following describes the output automatically obtained when these instructions are used; see OMNITAB II: User's Reference Manual for exact copy of the auto-output.

"BLOWUP, MARY M. STUDENT"
"EXECUTE LAB 7"

INSTRUCTIONS. USE THE "CORRELATION" COMMAND TO FIND THE CORRELATION BETWEEN THE X AND Y SCORES GIVEN IN P. 100 OF "BASIC STATISTICS" BY HAYS. (THESE ARE THE SAME DATA USED IN LAB 1).
USE THE "FIT" COMMAND TO OBTAIN THE REGRESSION EQUATION FOR PREDICTING Y FROM X (Y = A + B(X) -- FIND VALUES OF A AND B FOR THESE DATA). USE THE "STATISTICAL ANALYSIS" COMMAND ("STATIS") TO OBTAIN THE SUMMARY STATISTICS OF THE TWO SETS OF SCORES. YOU WILL NEED THE MEAN AND STD DEV OF X AND Y SCORES.

AFTER OBTAINING ALL OF THESE STATISTICS, DO THE FOLLOWING:

1. PLOT Y VERSUS X.
2. PLOT THE STD SCORES Z(Y) VERSUS Z(X).
3. USE THE SLOPE OF THE REGRESSION EQUATION AND THE STD DEV OF X AND Y TO CHECK THE CORRELATION COEFFICIENT GIVEN BY THE "CORRELATION" COMMAND.
4. FIND THE STANDARD ERROR OF ESTIMATE FOR THIS PROBLEM USING RAW SCORES AND/OR STANDARD SCORES. (SEE SECTION 15.3 in "STATISTICS FOR PSYCHOLOGISTS" BY W. L. HAYS).
5. EXPLAIN HOW THE SLOPE OF YOUR 1ST PLOT AND YOUR 2ND PLOT ARE RELATED.

THE 91 X AND Y SCORES ARE IN COLUMNS 1 AND 5.
THE WORKSHEET IS 100 ROWS BY 10 COLS.
BEGIN YOUR OMNITAB PROGRAM.

"CORRELATION OF 2 VARIABLES IN COLS 1 AND 5"

This command produces automatic printing of simple, partial, and rank correlation matrices plus significance levels and confidence intervals

for the correlation coefficients. This covers several 11" x 15" pages; a revised (shortened) auto-output option is available on the Texas version of OMNITAB.

READY
"DEFINE 1.0 INTO COL 2"
READY
"FIT Y IN COL 5, WTS = 1.0, 2 INDEP VARS IN COLS 2 (DUMMY) AND 1 (X's), STORE STATS IN 6"

This command produces several pages of output which includes estimates of least squares coefficients, the std dev of the coefficients, an ANOVA, predicted scores, residuals, and plots of the residuals. A shortened auto-output which is available on the Texas version of OMNITAB is given below.

Y = 1.13598 + 5.41862 (X1)

READY
"PLOT THE Y SCORES IN COL 5 VERSUS THE X SCORES IN COL 1"

This produces a plot of Y versus X. Scaling of the ordinate and abscissa is automatically done; as is labeling of the axes. The user can also provide scaling parameters and axes labels when using the PLOT command.

READY
"STATIS of COL 1, PUT THE STATISTICS IN COL 3"

This command produces several pages of output which includes 43 statistics for the set of data specified. The output includes mean, variance, std dev, median, raw scores, deviation scores, ordered scores, ranks, and much more. The calculated statistics are also stored automatically in the worksheet if the user so specifies.

READY
"STATIS OF COL 5, PUT STATS IN COL 4"

output

READY
"DIVIDE S(X) = 1.74 BY S(Y) = 11.64 AND PUT RESULT IN COL 6"
READY
"MULTIPLY COL 6 BY B = 5.42 AND PUT THE RESULT OF THIS CALCULATION IN COL 7"

```
    READY
"NOTE1 CORRELATION COEFFICIENT=(S(X)/S(Y))B"
"NOTE2 R          S(X)          S(Y)          B"
"1/ PRINT NOTE" Numbered commands are stored but not executed.
    READY
"2/ ABRIDGE ROW 10 OF COLS 7, 1, 5 and 6"
    READY
"PERFORM INSTRUCTIONS 1 AND 2"

          CORRELATION COEFFICIENT = (S(X)/S(Y))B

          R       S(X)        (S(Y)        B
          .81     1.74        11.64        5.42

    READY
"SQUARE THE RESIDUALS STORED IN COL 7 AND PUT IN COL 8"
    READY
"DIVIDE COL 8 BY N-TWO = 89.0 AND PUT IN COL 9"
    READY
"SQRT OF COL 9 PUT STD ERROR IN COL 10"
    READY
"ABRIDGE STANDARD ERROR OF ESTIMATE FROM ROW 1 OF COL 10"
                    6.82
    READY
"STOP"
```

APPENDIX III

Table 3

Using the checkpoint routine available in The University of Texas version of OMNITAB to store commands. The first set of commands would be prepared by the instructor and would be part of the OMNITAB system the student gets by requesting OMNITAB. This set of commands was prepared assuming that the data and instructions to be printed out and used by the student are already on tape.

THE INSTRUCTOR'S PROGRAM

```
" 1 / CREAD TAPE A D FORMAT 91 X AND Y SCORES INTO COLS 1 AND 2"
    READY
" 2 / CREAD TAPE A C FORMAT 15 LINES INTO COLS 11***18"
    READY
" 3 / PRINT C FORMAT COLS 11***18"
    READY
" 10 / PERFORM INSTRUCTIONS 1 THRU 3"
    READY
" 11 / FORMAT D   (F2.1,F3.0)"
    READY
" 12 / FORMAT C   (8A10)"
    READY
"STORE COMMANDS 1***3 AND 10***12"
"STOP"
```

THE STUDENT'S OMNITAB PROGRAM

```
"EXECUTE PROBLEM NUMBER 10"
```

This would result in the worksheet being initialized and instructions similar to those given at the top of Table 1 or 2 being printed out to the user. Following the line "BEGIN OMNITAB PROGRAM," the user would start work and would continue as shown in Table 1.